REMARKS

Claim 1 has been amended to describe a sonic energy source associated with the liquid outlet, and positioned adjacent to the workpiece for introducing sonic energy to the workpiece, with the sonic energy conducted through liquid flowing out of the liquid outlet and through the layer of liquid to the surface of the workpiece. See 0007 and 0019-22

Claim 16 has been amended to describe a rotor in the process chamber for holding the workpiece and rotating the workpiece. Claim 16 has been further amended to describe ozone gas in the process chamber diffusing through the layer of liquid and oxidizing contamination on the workpiece surface; with the sonic energy assisting to expose fresh contamination and rendering it more subject to oxidation by the ozone. See 0006.

Turning to the prior art, Torek *et al.*, USP 6,758,938, describes use of a spray of liquid. See Fig. 3; col. 2, line 12; col. 4, line 35; col. 6, lines 49-65; or use of a spray lid. Col. 7, lines 14-16. No other form of liquid outlet is described. As is well known in the art, such as the secondary references listed at paragraph 2 of the 3/8/2005 Office Action, sonic energy can only travel through incompressible media, i.e., solids or continuous liquids. The spray disclosed in Torek *et al.* is a stream of liquid droplets in air. The spray cannot transmit sonic energy. Consequently, since Torek *et al.* only discloses spraying, Torek *et al.* teaches away from use of sonic energy, as claimed.

In addition, the pulsing process 10, which is apparently used in all of the embodiments in Torek et al, is also not consistent with use of sonics. With an e.g.,

20% duty cycle (Col. 5, line 11), the sonics would necessarily be inactive %80 of the time. Moreover, apart from these important conceptual differences, in the apparatus described by Torek et al, there does not appear to be any reasonable way to use sonics as claimed, since the Torek et al apparatus is a batch system (as opposed to the single workpiece system of claim 16).

Torek *et al.* also shows the spray nozzles 75 spaced apart from the wafers. Fig. 3 suggests the spacing is several centimeters. This also teaches away from use of sonics, as claimed, since this spacing is not consistent with having a fluid link (see 0007) for transmitting sonic energy to the workpiece. The ozone shower system of Torek *et al.* (col. 2, line 61 et seq. and Fig. 3) also suggests spraying the edges of the wafer, rather than the wafer face. This suggestion also teaches away from use of sonic energy, as claimed. See specifically new claim 34.

Use of sonic energy has also historically been excluded from ozone processes. Ozone processes have largely relied on dissolved ozone. Sonic energy tends to cause ozone to come out of solution, reducing the ozone concentration in the liquid. This reduces the effectiveness of the process. For this reason, ozone and sonic energy have essentially not been used together. Accordingly, use of ozone and sonic energy would not be, and is not, obvious in the semiconductor processing field and in related fields. For these reasons, there is no suggestion in the prior art to combine any of the secondary references with Torek *et al.* -- since Torek *et al.* teaches against such a combination.

Relative to amended claim 16, as described at 0006 ozone gas in the process chamber diffuses through the layer of liquid and oxidizes photoresist or

other contamination on the workpiece surface. The sonic energy assists to expose fresh contamination and render it more subject to oxidation by the ozone. Shorter cleaning times can be used because final residues can be detached from the workpiece instead of having to be oxidized in-situ.

Turning to the secondary references, applicant does not here contest that use of sonics may be old in the art. However, the combination of the claimed elements, describing apparatus using ozone and heated liquid, with sonics, is not obvious in view of the prior art applied against the claims.

With respect to the content of the secondary references, Izumi *et al.*, USP 5,927,306, describes only a specific corrosion resistant ultrasonic nozzle. Miki *et al.*, USP 6,325,081 B1, contains a brief and somewhat vague reference to use of sonic elements 604 and 605. These elements appear to be separate from any liquid outlet, as claimed. See col. 14, lines 1-26. JP 01-095522 applies sonic energy through the wafer chuck. See the Abstract. The sonic elements again are unrelated to any liquid outlet, as claimed.

Fishkin *et al.*, USP 6,202,658, discloses a sonic nozzle used with a liquid jet. However, combining Fishkin *et al.* with Torek *et al.* conflicts with virtually the entire teachings of Torek *et al.* Fishkin *et al.* also relates primarily to wafer edge cleaning, and with liquid jet set at various angles to the wafer. Fishkin *et al.* makes no suggestion of providing a liquid layer on the workpiece, as claimed, as there is no reason given for having a liquid layer at the edge of the wafer, or any mention as to how a liquid layer could be provided at the edge of the wafer.

In view of the foregoing, it is submitted that the claims are patentable over the prior art. A Notice of Allowance is therefore requested.

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Respectfully submitted,

PERKINS COIE LLP

Customer No. 45540
Perkins Coie LLP
Patent - LA
P.O. Box 1208
Seattle, WA 98111-1208
Phone: (310) 788-9900
Fax: (206) 332-7198

By: Kenneth H. Ohriner
Kenneth H. Ohriner
Reg. No. 31,646